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(54) Title of the Invention: **Decorative Film**

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**SPECIFICATION**

**1. Title of the Invention**

Decorative Film

**2. Claims**

1. A decorative film, characterized in that a transparent or semitransparent first plastic film provided with a partially formed metallic half-mirror design, and a transparent or semitransparent second plastic film provided with a non-transparent or semitransparent printed design are bonded together by dry lamination, with the surfaces of the half-mirror design and the printed design facing inward.

2. The decorative film according to claim 1, characterized in that a third plastic film provided with a non-transparent or semitransparent printed design is bonded to the outer surface of the first plastic film.

3. The decorative film according to claim 1 or 2, characterized in that the first plastic film is provided with a partially formed metallic half-mirror design and a nontransparent or semitransparent printed design.

4. The decorative film according to claim 1, 2, 3, or 4, characterized in that an embossed design composed of minute irregularities is formed on the outer surface of the first plastic film.

### **3. Detailed Description of the Invention**

#### **(Field of Industrial Utilization)**

The present invention relates to a decorative film that is used while bonded to a dividing wall made of window glass or indoor glass, or other such various light-transparent surfaces or metallic reflective surfaces, and particularly relates to a decorative film having a so-called half-mirror design that either can be seen through or can be made to reflect light as a mirror surface and cannot be seen through, depending on the amount of light rays. Possible examples of the light-transparent surface include glass, an acrylic plate, a vinyl chloride-based resin plate, an acrylic plate, and the like, and possible examples of the reflective surface include stainless steel, aluminum, chrome, nickel, a mirror plate, and the like.

#### **(Prior Art)**

This type of half-mirror film has a structure in which aluminum, gold, silver, or another such metal thin film is formed by sputtering or vapor deposition on a polyester-based or vinyl chloride-based transparent film, and is used while bonded to a window or another such glass surface.

However, conventional half-mirror films appear to be of low quality when the reflected light gives the surface a metallic sheen, in which case they would be unsuitable to be used while bonded to a dividing wall made of window glass or indoor glass, or another such glass surface in which appearance is an important factor.

Therefore, the applicant has previously submitted a patent application pertaining to the development of a half-mirror-type decorative film that has a composite structure of a half-mirror film and a film on which a printed design is formed, and that has an improved appearance and functionality (Patent Application No. 2-87559).

**(Problems to Be Solved by the Invention)**

However, in the invention developed by the aforementioned applicant, the printed design may be visible on the metallic, lustrous reverse side of the film when it is seen with reflected light, but when the film is attached to glass and is seen with transmitted light, the metallic thin film is not completely transparent, appears to be blackened, and creates a sensation of being boxed in for the viewer.

The present invention was designed in view of these problems, and an object thereof is to provide a decorative film that employs a half-mirror structure, which is further improved in terms of appearance regardless of whether it is seen in transmitted light or reflected light.

**(Means Used to Solve the Above-Mentioned Problems)**

Next, means for solving these problems will be described with reference to diagrams corresponding to the working examples.

Specifically, the first decorative film 1-1 relating to the present invention is characterized in that a transparent or semitransparent first plastic film 3 provided with a partially formed metallic half-mirror design 2, and a transparent or semitransparent second plastic film 5 provided with a non-transparent or semitransparent printed design 4 are bonded by dry lamination, with the surfaces of the half-mirror design 2 and the printed design 4 facing inward, as shown in Figs. 1 through 3.

Also, the second decorative film 1-2 relating to the present invention is characterized in that a third plastic film 7 provided with a non-transparent or semitransparent printed design 6 is bonded to the outer surface of the same aforementioned first plastic film 3, as shown in Figs. 4 through 6.

Also, the third decorative film 1-3 relating to the present invention is characterized in that the aforementioned first plastic film 3 is provided with the partially formed metallic half-

mirror design 2 and a nontransparent or semitransparent printed design 8, as shown in Fig. 7. In this third decorative film 1–3, the printed design 8 is formed on the inner surface of the first plastic film 3, and the half-mirror design 2 is partially polymerized and formed thereon.

### **(Operation of the Invention)**

Next, the operation will be described in which the decorative film of the present invention described above is used while attached to a glass or plastic light-transparent plate 9.

When the first decorative film 1–1 in Figs. 1 through 3 is seen from the side of the second plastic film 5 under reflected light, the printed design 4 is visible on the metallic reflective surface of the half-mirror design 2, as shown in Fig. 3(A). When the film is seen under transmitted light, the half-mirror design 2 is either hardly visible or is slightly visible in semitransparent fashion, and the printed design 4 is visible, as shown in Fig. 3(B).

Also, when the second decorative film 1–2 in Figs. 4 through 6 is seen from the side of the second plastic film 5 under reflected light, only the front printed design 4 is visible on the metallic reflective surface of the half-mirror design 2, and the rear printed design 6 is not visible, as shown in Fig. 6(A). When the film is seen from the side of the third plastic film 7 under reflected light, only the rear printed design 6 is visible on the metallic reflective surface of the half-mirror design 2, and the front printed design 4 is obscured by the half-mirror design 2 and is not visible, as shown in Fig. 6(C). Both the front and rear printed designs 4 and 6 are visible in the portions devoid of the half-mirror design 2. The front and rear printed designs 4 and 6 are visible from either the front or reverse side under transmitted light as shown in Fig. 6(B), and the half-mirror design 2 is either hardly visible or slightly visible in semitransparent fashion.

The operation of the third decorative film 1–3 in Fig. 7 is substantially identical to that of the second decorative film 1–2.

### **(Working Examples)**

Figs. 1 through 3 show the first decorative film 1–1 relating to the first working example of the present invention.

The schematics of the configuration and operation of the first decorative film 1–1 are as described above. Basically, the second plastic film 5 on the front layer is composed of a

transparent vinyl chloride-based resin film, with a design of minute irregularities made from an embossed design 5a formed on the front side thereof, and an arbitrary printed design 4 formed in a single color or multiple color tones on the reverse side. Also, the first plastic film 3 on the reverse layer is composed of a polyester-based resin film, and a metallic half-mirror design 2 composed of an arbitrary design, such as a geometric design or a plant leaf or flower design, for example, is dispersed and formed in sections on the front side thereof.

This half-mirror design 2 is formed from a metallic thin film that can be subjected to vapor deposition or sputtering, such as Al, Ti, Ni, Cr, Cu, Ag, or Au. The light transmissivity thereof varies between 10 and 70% depending on the vapor deposited surface area and the type of metal. Also, the surface area of the half-mirror design 2 is 50% or less and 5% or greater of the entire surface area of the first plastic film 3, and the range of the surface area is selected according to whether or not the printed design 4 is formed on one or both sides of the metallic half-mirror design 2, as is the case with the third decorative film 1-3 in Fig. 7 or the plate having the printed design 4 that is to be joined. As a specific working example, Al is vapor-deposited on the first plastic film 3 composed of a polyester-based resin in a half-mirror having a light transmissivity of 15%, a top coating is formed in order to prevent oxidation of the Al, a pattern is formed thereon with resist ink, and the portions of the Al vapor deposited film devoid of the resist ink are washed off in an aqueous solution containing 2% hydrogen fluoride, forming a half-mirror design 2.

Urethane-based adhesive 10 is applied in a dry thickness of 15  $\mu$  to the surface of the design of the first plastic film 3 having the half-mirror design 2 formed in this manner, and the design surface of the second plastic film 5 is subjected to dry lamination.

The second decorative film 1-2 relating to the second working example in Figs. 4 through 6 has a third plastic film 7 composed of a vinyl chloride-based resin film having a printed design 6 with a different pattern than the printed design 4 formed by dry lamination on the outer surface of the first decorative film 1-1. Thus, more plastic films with other half-mirror or printed designs can be laminated in multilayered fashion.

The third decorative film 1-3 relating to the third working example in Fig. 7 has a printed design 8 in which a different pattern is formed either on the top or bottom of the half-mirror design 2 on the inner surface of the same first plastic film 3 as the first decorative film 1-1

described above. This printed design can either be formed in multilayered fashion on the top and bottom of the half-mirror design, or it can be formed on the outer surface of the decorative film.

In the working examples described above, as a result of increasing the light transmissivity of the half-mirror design 2, the half-mirror design 2 is made nearly transparent under transmitted light, and the design is mildly visible because of the lack of any darkening. Also, when seen under reflected light, the half-mirror design 2 is seen as being formed only partially, and the viewer therefore does not have a sensation of being boxed in as if by a metallic wall.

#### **(Effect of the Invention)**

As was described above, according to the decorative film that utilizes half-mirror effects relating to the present invention, the half-mirror design 2 is formed only partially in a pattern so that the shading thereof overlaps with the printed design and is mildly visible under transmitted light, the viewer does not have a sensation of being boxed in as if by a metallic wall in reflected light, and the half-mirror design overlaps with the printed design. The film thus has a wider range of application.

#### **4. Brief Description of the Drawings**

Fig. 1 is a cross-sectional view of the first decorative film relating to the present invention;

Fig. 2 is an exploded view of the same film;

Fig. 3 is a front and reverse side view showing variations in the design of the same film;

Fig. 4 is a cross-sectional view of the second decorative film relating to the present invention;

Fig. 5 is an exploded view of the same film;

Fig. 6 is a front and reverse side view showing variations in the design of the same film;  
and

Fig. 7 is a cross-sectional view of the third decorative film relating to the present invention.

1-1, 1-1, 1-3 ... decorative film

2 ... half-mirror design



3 ... first plastic film

4, 6 ... printed design

5 ... second plastic film

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FIG. 1

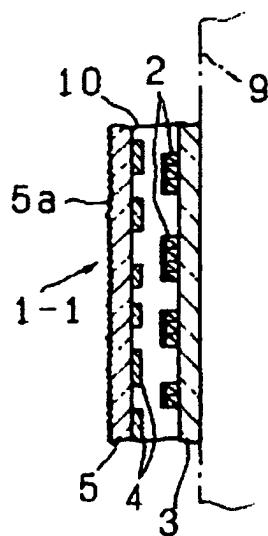


FIG. 2

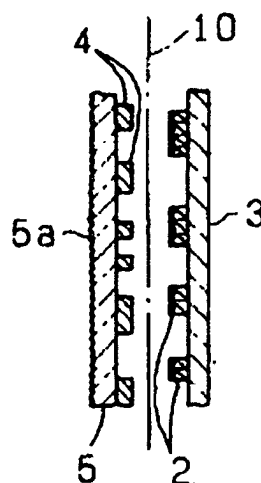
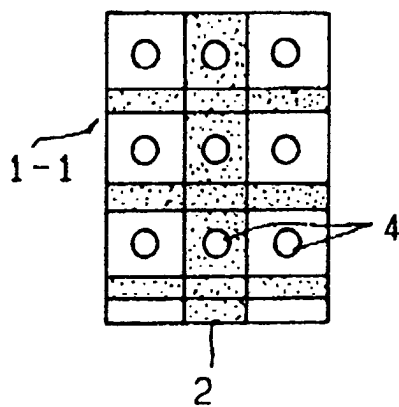


FIG. 3

(A)



(B)

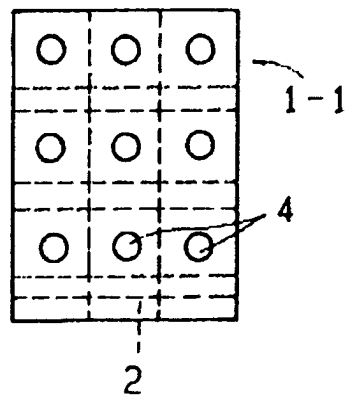


FIG. 4

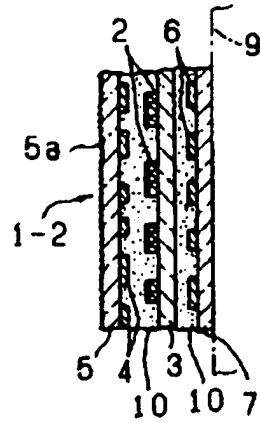


FIG. 5

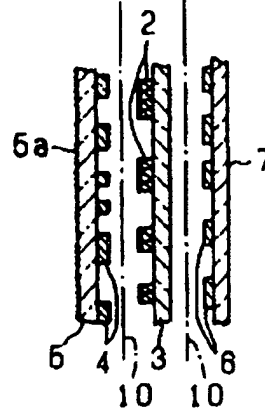


FIG. 6

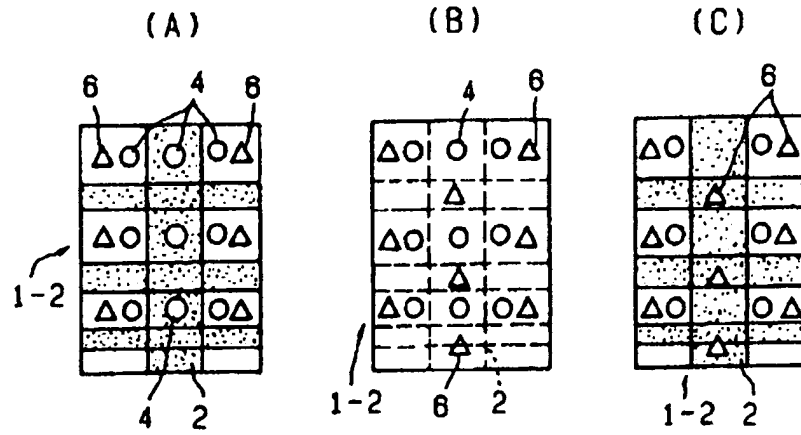


FIG. 7

